Aerodynamic Characteristics of Indent Stay Cables of Tatara Bridge

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Summary

Since the longest stay cables of the Tatara Bridge are about 460 m, various wind tunnel tests were carried out. As a result of the tests, it was found that an indent cable is very effective against rain vibration and the indent cables were applied to the bridge for the first time in the world. It was also found that smooth wind flow without rain is possible to generate large amplitude vibration. As it was thought that this vibration was rarely generated due to actual wind condition, it was decided that countermeasures against this vibration were studied based on monitoring results, if necessary. Monitoring of the cables has been conducted with measurement of wind and rain fall. Although medium amplitude vibration, which was not rain vibration, was observed on the short indent stay cables, harmful vibration such as rain vibration has not been observed until now. Therefore, it was confirmed that the indent cable is effective against rain vibration.

Keywords: Cable stayed bridge, stay cable, indent cable, rain vibration, aerodynamic measure, monitoring, turbulence intensity, relative angle of wind.

1. Introduction

The Tatara Bridge was completed in May 1999 as the world's longest cable-stayed bridge. The centre span of the bridge is 890 m, while the side spans are 270 m and 320 m, as shown in Figure 1. As the side spans are relatively short in proportion to the main span, prestressed concrete girders were selected at the end of side spans as counterweights, while the other was a steel box girder.

The Bridge has the multi-fan type stay cables with two planes. Each cable consists of galvanized steel wires and is covered with polyethylene. Since the longest stay cables have an unprecedented length of about 460 m and their lowest natural frequency is 0.26 Hz, it was necessary to study aerodynamic characteristics of the cables in the very low natural frequency range.

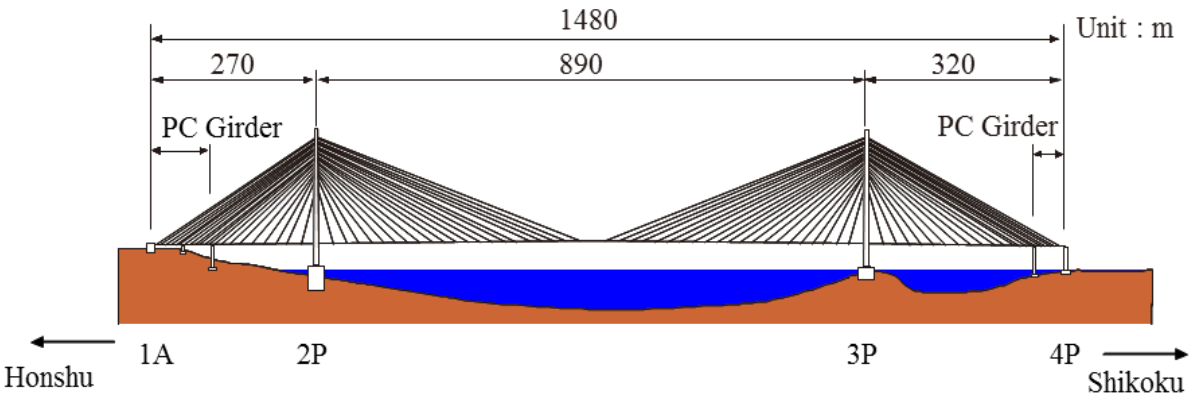

Fig. 1: General view of Tatara Bridge

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